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PRE-ANALYTICAL AND POST-ANALYTICAL DATA[1]

THE term "datum" is burdened with a grave ambiguity. What are we to understand by it? Are we to understand by a datum that with which analysis begins, or are we to understand by it that in which analysis terminates? Designating by "pre-analytical," whatever is given *for* analysis, and by "post-analytical," whatever is given *through* analysis, we wish to ascertain whether there is any possibility of assimilating to one another these two classes of data. But first let us observe in what respect they are dissimilar.

The difference between them may in general be regarded as a difference in signification. What starts analysis is one thing, what ends it is quite another. In science, a datum signifies whatever inaugurates and prompts investigation. The given is what science starts with; the given is what it works upon. It is the given which is observed, described, and explained. Whatever elicits the operations of the scientific method may be said to be a datum: an earthquake is a datum, a sunset is a datum, an epidemic is a datum, mutability is a datum. The given is literally anything and everything enticing inquiry and analysis. In epistemological parlance, however, a datum signifies something more refined; it is the result of subtle discrimination. It is what we discover by "extensive abstraction." Take perception as an example. Is it a datum? Yes and no. It is undeniably "given" as the starting point of investigation. Yet this "scientific" use of the given, applicable to perception as a whole, is not the epistemological; in epistemology the term "datum" applies only to that part of the perceptual situation wrought by rigorous analysis. As terms in epistemological discourse, data signify the irreducible entities in the objects of cognition. They are "post-analytical"; they acquire their status as data only *after* strenuous discernment.

Bertrand Russell, for example (in *The Problems of Philosophy*), defines data, qualified in this particular instance as "sense-data," as "the things that are immediately known in sensations." To grasp the meaning of a "sense-datum," we must clearly distinguish it from the sensation, which is "the experience of being immediately aware

[1] Read at the Pacific Division of the American Philosophical Association, Mills College, Nov. 26, 1926.

of these things," and from the "physical object," which is the thing obtained by inference. The total perceptual situation, as it arises concretely, involving all these three logically isolable elements in some sort of union, is, of course, the scientific or pre-analytical datum inducing inquiry. Yet, the term "datum," in its epistemological or post-analytical sense, is applied neither to sensations nor to physical objects, but only to those qualities, such as colors, sounds, smells, which are but logically separable from sensations and physical objects. Actually, if "given" at all, "sense-data" are given with sensations and physical objects, not in detachment from them. The datum *of* analysis, the occasion generative of inquiry, is thus not the same as the datum achieved *through* analysis, the fruit generated by it.

Mr. Santayana's "essences," to invoke another illustration, have in common with Mr. Russell's "sense-data" the character of being post-analytical. Essences, as the "data of experience," can be recognized as such solely by "discernment"; for essences, as the objects of "pure sense or pure thought, with no belief super-added,"[2] may lay claim to the appellation of data only when sense (or thought) is "pure," and when "belief" is suspended. To "discern" essences as thus defined, it is manifestly necessary to perform a highly complicated analytical operation; we must sever from ordinary perception, which is a form of "faith," the faithless awareness (if I may so call it) of the immediate. Only "intuition"—Mr. Santayana's name for awareness without faith—has data; the data, being "apparent" characters or qualities directly contemplated, can not be taken as evidence of any existing facts or events; facts and events constitute the realm of external nature and as such are objects of "animal faith" (*i.e.*, perception) and never objects of faithless sense or thought (*i.e.*, intuition). With the aid of the refined distinction between intuition and perception, Mr. Santayana (in *Scepticism and Animal Faith*) is able to formulate his recondite doctrine that nothing given exists, and that nothing that exists is given. But obviously, "the given," in this rarefied sense, is not the starting-point of analysis; it is rather its ultimate halting-place. What is actually given is the perceptual situation as a whole, inviting and permitting the labor of discrimination; when analysis has done its discerning work, the datum undergoes a shift in meaning and becomes identified, not with the original occasion for analysis, but rather with an ulterior product of it.

It is not necessary for my purpose to multiply illustrations. Whether epistemological data are named sensa, sensations, essences, universals, point-instants, or events, they are data merely by ana-

[2] *Essays in Critical Realism*, p. 168 (note).

lytical courtesy. They are "given" in the sense that discernment can descry nothing more elementary; they are names for elements or entities so ultimate that their discovery compels analysis to stay its effort. The "given," then, is a concept possessing seemingly no unequivocal meaning: in science, the datum is the *source* of analysis, in epistemology, it is the *limit* of analysis. From this main distinction follow certain specific differences. I shall briefly mention three.

In the first place, the datum, as employed in science, is a *compendious* concept, denoting any fact, event, situation, or circumstance, sufficiently authentic to be verified, and sufficiently problematic to challenge explanation. Whatever is, is a datum, if and when it assumes the character of a communicable object, yielding to determination by the scientific method. From this point of view, all the objective facts of the world, regardless of their origin and constitution, are possible and potential data of science. Thus democratic and flexible is the scientific use of the given. This elasticity is wanting when we encounter the datum as an epistemological concept, applicable as it is, not to anything and everything under certain conditions, but to a restricted or favored class of entities or qualities or relations characterized by adjectives uncompromisingly ultimate. "Pure" data, "irreducible" data, "original" data, "primitive" data, "immediate" data, "indubitable" data—these are the things which in epistemology the solvent work of critical analysis is endeavoring to disclose. Whether such data are data of sensing, intuiting, perceiving, or thinking, they are regarded as "given" in an *absolute* sense, simply because analysis is supposed to be unable to go beyond them. Unlike, then, the data of science, which, borrowing Mr. Russell's nomenclature,[3] we may call "soft" data, those entities characterized as given by different theories of knowledge must be described as "hard" data—they are the stark and irresilient constituents in the cognitive situation.

In the second place, the data of science must as *objects* of description be distinguished from the *terms* in which the description is couched. The given is that which scientific description renders more determinate or more intelligible in such terms as the crucial observations and experiments provisionally justify. More elaborate investigation, under different conditions and by means of more refined methods, very frequently leads to the discovery of new facts or new relations requiring a change in the terms of the description. When a more adequate study of any "given situation" necessitates a different description of it, what happens is that we simply exchange one set of terms for another; the datum, however fluctuating the

[3] See *Our Knowledge of the External World*, pp. 70–71.

descriptive terms, is the same original occasion at the behest of which the descriptive process is set in motion. The "given" in science, in short, signifies, not that by which it is described, but rather that to which the description addresses itself. It is otherwise in epistemology; there "data" connote not the objects, but the terms of the description. Not the objects of knowledge are accepted as given, but only those ultimate entities or qualities or essences or relations by which they may be parted and into which they may be resolved. The "hard" terms, those resisting the assault of analysis, these alone merit the appellation of data.

I am, of course, not disposed to question the legitimacy of designating by data the ultimate terms (if such can be fixed) rather than the anterior objects of description. All I wish to emphasize is the fact that we have here to do with apparently two different uses of the given. If *X* is the object of description, and if *a*, *b*, and *c* are the terms in which the description can be expressed, what exactly *is* given? For science the given is primarily *X;* if for the nonce *a*, *b*, and *c* are discovered to be relevant to it, then the total datum is "*X* as described by *a*, *b*, and *c*"; and if eventually, in the light of more stringent scrutiny, the terms have to be replaced, then the total datum is "*X*, previously described by *a*, *b*, and *c*, but now more adequately describable by *d*, *e*, and *f*"; and so with every shift in the terms which the exploration of *X* might render necessary. Always it is *X* which is the given, the terms (*a*, *b*, and *c* or *d*, *e*, and *f*) are given only in so far as observation and inference permit their ascription to it. For epistemology, on the other hand, the given is not X, but rather the ultimate entities to which analysis, if pushed to the limit, can reduce it. Given in the strict sense are the irreducible or "hard" terms by which the complex object of knowledge is describable. Thus if *X* is a physical object of perception, we may, following Mr. Broad's terminology,[4] describe it (*a*) by what is "sensibly given" (images of the object actually present), (*b*) by what is "mnemically given" (sensible characteristics ascribed to it in consequence of past experience), and (*c*) by what is "categorially given" (various non-sensible characteristics, such as identity and persistence, attributed to it). *X*, though the unitary object of description, is not itself the datum; it is a complex of different data, psychologically heterogeneous, actually fused, but logically separable; the data, in short, are identified with the terms by which the description of *X* is achieved. The given in epistemology, unlike the given in science, signifies not the complex capable of reduction, but the elements to which it may be reduced.

[4] *Concepts of Continuity,* Supplementary Volume IV of the *Proceedings of the Aristotelian Society* (1924), p. 112.

It follows, in the third place, that the scientific datum, connoting for the most part something supple and provisional, coincides essentially with what we ordinarily mean by a *problem.* The given from which scientific inquiry takes its start is neither an unquestioned fact nor the indubitable knowledge of it. Whether the datum is a fact or an event challenging observation and description, or whether it is a particular hypothesis designed to explain or interpret the subject of inquiry, or whether it is a specified way or condition necessary for the verification of the hypothesis, or whether it is an established theory awaiting added confirmation through the discovery under its ægis of still unknown facts—in every case the datum suggests a situation palpably problematic. For the "given" fact or event remains enigmatic until completely specified and determined, the "given" hypothesis continues doubtful until the process of testing it has come to an end, the "given" ways or methods conditioning verification share the uncertain fate of the hypothesis, and the "given" theory is relatively insecure until the facts of which it is prophetic have been fetched from the Unknown. In all these cases "the given" and "the problematic" are interchangeable concepts. And this is so because the scientific datum, though often the product of analysis and description, is the theme and source of perennial investigation. As a whole or as incident in a wider context, the given is for science a continual challenge, always remaining "pre-analytical," in the sense of never condemning as bootless the task of more searching analysis. The epistemological datum, being by contrast "post-analytical," in the sense of suggesting the futility of a more rigorous discernment of it, has a finality which can never belong to the scientific datum. Being the product of the solvent activity of analysis, an activity envisaged as completed, the epistemological datum is a solution rather than a problem. It terminates analysis, since it is that *in* which analysis terminates. The given thus discovered, when analysis has drawn its last breath, is ultimate with a vengeance! It can not be reduced to anything simpler or more elementary. It is a "datum," not an "object," precisely because it is irreducible. For one of the distinguishing marks of an object, as it concerns epistemology, is the possibility of applying to it the principle of "reduction." What *may* be resolved into unanalyzable terms and relations is an "object"; the unanalyzable terms and relations themselves are the "data." The difference between "objects" and "data," as thus stated, enables certain philosophers to formulate in a fruitful fashion the "problem" of knowledge. Problematic, indeed, are the objects of knowledge, exhibiting as they do all sorts of internal intricacies and external affinities; but by the principle of reduction we may discover the

ultimate data needed for their valid description and interpretation. These data, unlike the objects, are certain and indubitable, since the principle of reduction does not apply to them. One of the main tasks of epistemology is thus clearly defined. It consists in the discovery of the sure and unassailable data to which the problematic objects of knowledge may be rendered amenable.

Such, then, are the different meanings of the given, depending upon the context in which it is employed. In what, we may now ask, consists the similarity between the two uses of the given? Is there any logical continuity between pre-analytical and post-analytical data? I shall attempt to show that the difference between the two sorts of data is a matter of degree. Deeper than the distinction is the resemblance. The given as encountered in epistemology is simply a variation of the more compendious scientific concept. The epistemological datum partakes of the same essential traits as belong to its scientific prototype. It, too, signifies nothing more than (*a*) a point of departure, (*b*) an object of description, and (*c*) a problematic situation. And if it can be shown that the epistemological datum is "scientific" in disguise, it will have no insignificant bearing upon the problem of knowledge.

It will be conceded that, in its primary and scientific use, the datum is that which is needed to start knowledge going. It is literally its *starting-point*. It may be a problem or it may be one of the hypotheses of a problem. It may be a certain hypothesis provisionally verified or it may be a law or theory relatively established. It may be anything and everything. But it is always that which (using Mr. Santayana's expressions in a different sense) is first in the "order of genesis" and first in the "order of evidence" as regards the course of any particular inquiry. The datum is the initial state or stage in any investigation. The designation of it as *pre*-analytical epitomizes its priority both temporal and logical. But such priority is essentially relative. There is nothing which can not serve as starting-point. There are for scientific knowledge no *fixed* seeds or beginnings. The results of one science often are the data of another. Now, the datum which in science is a relative starting-point (*i.e.*, relative to a "problematic situation" in need of observation and analysis) becomes in epistemology a point of departure purged of relativity. The datum is the absolute seed of knowledge. Though "post-analytical," in the sense that analysis is the vehicle of its discovery, in origin and certainty the datum is regarded as actually primogenital. Analysis of the complex objects of knowledge is supposed to carry us back to their germinal constituents. The epithets "original," "primitive," and "elementary," often employed in characterizing epistemological data, are designed

to show that the constituents "precede" that which is constituted by them, though it is not always clear whether these epithets should be taken as denoting temporal or logical priority. At all events, the meaning of "starting-point," whether genetic or evidential, which the datum has in science, is retained in epistemology. But whereas in science the point of departure is quite elastic, being assumed for the sake of carrying *forward* the chosen scrutiny of a problematic situation, "the given" in epistemology signifies an absolutely fixed point, genetic or evidential, in which knowledge is supposed to have its embryonic source, and to which analysis of the object of cognition may carry us *backward*. The epistemologically "given," then, recoverable through analysis, *i.e.*, by separating and isolating the various elements of which "objects" are fusions, coincides in the end with the notion of an actual and absolute beginning.

The epistemological datum, too, is an "object" of description, logically distinct from the "terms" that characterize it. Consider once more the distinction between X (any object of description) and a, b, and c, or d, e, and f (the terms used in the description). With its aid we may, indeed, represent in graphic fashion the apparent difference between the given in science and the given in epistemology. X, we have urged, is the scientific datum, being that from which the *investigation* takes its start; a, b, and c or d, e, and f by which X is rendered determinate are relevant only as observation and inference permit the datum to be described by them. More adequate study of the given situation may, of course, prescribe a change in the descriptive terms. The epistemological datum, we have insisted, is never explicitly X, since the given is identified, not with the relative starting-point of the investigation, but rather with the original and primitive elements to which the *investigated object* may be reduced by analysis. And in so far as a, b, and c or d, e, and f are such ultimate terms, they and not X must be designated as the given. But this is not the whole truth of the matter. Strictly speaking the "terms" into which the analyzed objects are resolved are *not* themselves the "data." They are but descriptive *names* for what is actually elementary in the objects. As long as the distinction must be maintained between the terms that figure in the description and that of which the terms are descriptive (and how else can the description avoid being a description of nothing?), the epistemological data are manifestly the irreducible *entities* themselves, not the *terms* by which they come to be designated. What names shall we give to what is *actually* primitive in our cognitive experience? Shall we call it a sensum or a sensation, an image or a quality, an idea or an event, an essence or a point-instant? What we shall *name* it obviously depends upon the pos-

sibility of discovering what in the concrete objects of experience is really and genuinely primitive, original, and elementary. And this possibility depends upon our ability, on the one hand, to recover by insulating from the field of judgments and inferences (which is the field of concrete knowledge) an immediate type of apprehension (assuming the ultimate data to be accessible solely to such a type), and, on the other, to uncover by analysis the actually irreducible constituents of objects (assuming such constituents to be identical with what immediate awareness when *purely* immediate is bound to encounter). How far such awareness can be recovered, and such constituents uncovered, is a question that does not here concern us. What I wish to emphasize is the fact that in epistemology, no less than in science, the distinction must be made between the given and the terms by which it is designated. The epistemological datum, denoting whatever ultimate content or state or condition or entity is at the primitive base of knowledge, is the supposititious "object" of description, logically distinct from the "terms," such as sensa, sensations, essences (and the rest), that are designed to denominate it. Whether such terms are *truly* descriptive of their object is, of course, a crucial question, raising as it does the issue as regards the validity of the method by which such an object is discovered and identified, an issue always critical for the relation between whatever is the described and the description thereof. After all, the epistemological datum is just as much of an X as is the scientific datum. But whereas in science X signifies *any* object or situation with which or from which inquiry may move forward, a, b, and c or d, e, and f being such descriptive terms as the investigation in question may render appropriate, in epistemology X stands for that which is actually aboriginal in the cognitive situation, and a, b, and c or d, e, and f are those terms by which it may be completely identified either on the basis of immediate awareness or on the basis of final analysis.

And this X, the aboriginal object of description, distinct from the names by which it is labelled, is it less problematic than the data of science? We can easily see that "the given" and "the problematic" are concepts as interchangeable in epistemology as they are in science. For what in the last analysis is the epistemologically given? To repeat: Not the *objects* of any particular cognitive process (*i.e.*, perception, memory, imagination), since such objects as well as the processes appropriate to them are subject to the principle of reduction. Nor the irreducible *terms* themselves (if any such can ultimately be agreed upon) which analysis or intuition[5]

[5] In speaking of "intuition," its appositeness (not its opposition) to "analysis" should be emphasized. As used in epistemological contexts, intui-

may succeed in yielding, since they are but names identifying the data they are designed to describe, not identical with them. The fatal ambiguity from which such terms suffer renders them particularly inept, descriptive as they are of two *logically separable* sets of entities. On the one hand, epistemological terms parading as irreducible describe those entities in which the analysis of the object literally *terminates,* and, on the other, the same terms describe those entities from which the object literally *originates.* Things characterized as "terminal" and "originative" are manifestly not equivalent. What is the ground for asserting that the entities before which analysis (or intuition) is obliged to halt are the same entities which are objectively primogenital? The situation is equally problematic whether we regard these entities as non-identical or as identical. If not identical, what shall we consider as the ultimately "given"? Those entities which are *logically final,* or those which are *ontologically aboriginal?* And if identical, how can we be sure whether the limits of analysis are subjective limits or objective limits? Is that which evades our analysis by that very token actually primitive? How distinguish the spurious finality of analysis, due to our impotence to discern, from the genuine end of analysis, due to the fact that the objectively indiscernible has at length been reached? Such questions, to which no single answer appears to have the right of way, seeing that so many conflicting "terms," all perfected by resolute analysis, lay claim to being authentically descriptive of the ultimately "given," tend to show that the data of epistemology are certainly no less problematic than are the data of science.

I feel justified, therefore, in viewing the concept of the problematic as interchangeable with the concept of the given, be the given qualified as pre-analytical or as post-analytical, as scientific or as epistemological. Whatever is given, in whatever sense, is given as a problem. Probe the given to the uttermost depth, and you will encounter nothing more ultimate than the problematic. Absolute incipience, whether genetic or logical, which is the epistemological datum *par excellence,* is an ideal limit of analysis, in the end as paradoxical a conception as that of the "First Cause." The data of epistemology, we may concede, are indeed post-analytical, "analytical to the death," to employ an expression of Mr. Alexander's[6];

tion is itself an analytical product, in the sense that neither its enjoyment nor its definition is possible without a process of abstraction or insulation. For what is meant by intuition is always something severed, actually or logically, from ordinary knowledge (such as perception), which is a conscious process essentially complex, shot through as it is with "belief," with judgment and inference.

[6] *Space, Time and Deity,* Volume I, p. 175.

but how far can analysis to the death carry us? Surely not beyond the terms before which analysis is obliged to pause mortally exhausted! Where is the guarantee that what is logically terminal is in reality primordial? The end of analysis is not necessarily the beginning of knowledge.

It is, of course, true that all knowledge begins with the given and proceeds from the given. But what is the given? Not a "gift," as the word "given" unfortunately suggests, a thing of definite quality and intent. The given is not a gift. It is not a thing. It is not a quality. It is not an intent. We must perforce be satisfied with the definition of it as a problem. It is the incipient occasion or the generating condition of the cognitive situation. To say this is to exhaust, I think, the meaning of the given *qua* given. For neither intuition nor analysis can reveal anything save an urgent occasion precipitating the process of description. However the occasion be envisaged, as long as it remains distinct from the terms that describe it, it must needs be defined as a "problematic" object, in the sense that between its primordial nature and the profferred description of it there may be a wide chasm, necessitating fresh intuitions and renewed analyses. The appeal to "finality," whether of intuition or of analysis, is of no avail, for "finality" may betoken a subjective limitation rather than an objective criterion. The distinction between pre-analytical and post-analytical data is thus a relative distinction. It is a distinction within the realm of the problematic. And this is all I have intended to exhibit. What ensues for epistemology and for metaphysics from the conception of the datum as something ultimately problematic is a long story, not to be told here.

J. LOEWENBERG.

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MECHANICAL EXPLANATION: ITS MEANING AND APPLICABILITY

I

SINCE explanation involves entities in relations, for to explain a given phenomenon is to subsume it under a known law and law asserts correlation between variables, there are two questions about mechanical explanation which we must consider: (1) What is mechanical relation? and (2) What is the nature of mechanical entities? The mechanical relation is obviously a non-purposive type of causal relation, a relation in which, given the condition, the phenomenon in question follows, and, removing the condition, it ceases to follow.

To define the nature of mechanical entity or entities is not, however, so simple a task. Most liberally the mechanical entities may be defined as perceptual. Jennings, in distinguishing mechanism from vitalism, points out that in mechanism "later perceptual diversities . . . are always preceded by earlier perceptual diversities."[1] In this definition mechanical entities are taken to be perceptual. It is usual, however, to explain "perceptual diversities" as physico-chemical entities. But what does one mean by physico-chemical entities? C. D. Broad finds five distinct meanings applied to these entities. Two of his interpretations involve "macroscopic" (*i.e.,* perceptual) entities. A third one involves "heterogeneous microscopic" (*i.e.,* imperceptual) entities, and the last two interpretations involve the most rigid form of "homogeneous microscopic" entities.[2]

As to the possibility of the reduction of the macroscopic to the microscopic entities Broad writes as follows: "It is useless to say that perhaps the differences between an atom of oxygen and one of hydrogen are merely differences between the number and configuration of two different groups of precisely similar particles, whose laws are mechanically analysable. Perhaps they are. But since chemistry has no need to make any assumptions on the question one way or the other, the success of the atomic theory up to the present can have no tendency to support this view, and therefore can reflect no credit on homogeneous or pure mechanism."[3] Though pure mechanism with its perfect homogeneity represents the simplest conceivable assumption as to entities, Broad remarks that pure mechanism is hardly used by anyone. The electron theory, which comes nearest to it, has its positive and negative particles.

Is it possible to frame a definition of mechanical entities which would bring all the different interpretations into one class? The common element of all the mechanical entities, we think, is their measurability. Physics, chemistry, and mechanics differ *inter se,* but in the description of the given phenomena all of them employ only such entities as can be described by the use of measurement. Mass, *e.g.,* is defined by the physicist in terms of positions and motions involving only such quantities as can be determined by the use of measurement. A unit quantity of heat is the quantity required to raise a unit mass of water one degree centigrade. A unit quantity of electricity is the quantity which acts on a similar quantity with unit force at unit distance. And a unit force is one which would impart to a unit mass a unit acceleration. As a last example, a

[1] "Mechanism and Vitalism," *Philosophical Review,* 1915, Vol. 27, p. 578.

[2] "Mechanical Explanation and Its Alternatives," *Proc. of the Aristotelian Soc.,* 1918–1919, p. 102.

[3] *Ibid.,* p. 108.

unit atomic mass involves measurements which determine mass and volume.[4] If, then, in mechanical explanation we employ only causal relations and measurable entities, we may define mechanical explanation thus: Mechanical explanation of a given phenomenon is its subsumption under laws which employ only causal relations, and only such entities as can be described by measurements. Laws of this type are called natural laws. Though this definition is sufficient to distinguish mechanical explanation from other types of explanation, such, *e.g.*, as purposive or vitalistic, where non-causal relations or non-measurable entities are used, it should be observed that the mechanical ideal is more rigorous. The ideal mechanical explanation is an attempt to arrange the laws of nature in a series of subsumptions of such a kind that we might regard each law as capable of reduction to the more elemental, until at last we come to the laws employed by mechanics, *i.e.*, Newton's three laws of motion or some substitutes for them. In our present discussion, however, we shall refer to mechanical explanation in its broader meaning and will not confine ourselves to its ideal.

There are three important consequences of our definition of mechanism. In the first place mechanism, in subsuming the given phenomenon under laws of nature, eliminates all references to purpose. Mechanism is a non-purposive, or, using Professor Singer's term, an ateleological type of explanation.[5] Its fundamental concepts are stripped of all anthropomorphic coloring. Cause, *e.g.*, does not mean activity but uniformity of correlation according to law and law is expressed by equations that symbolize relationships between variables. Secondly, mechanism is deterministic. The fundamental assumption is that the discovered relation is bound to take place and no other can. When, *e.g.*, we state the law of falling bodies, we do not imply merely that they happen to have the same acceleration, but that they *must* have the same acceleration. The world is so constituted that the given order can not be otherwise. It is for this reason that in a Laplacean mechanistic world, if we knew the masses, the space distribution, and the velocities at all points at any given moment we could calculate the masses, the space distribution and the velocities at all points for any other time. And, lastly, the ideal of mechanism is to present the simplest type of explanation. Mechanism attains this ideal of simplicity or economy of explanation by the reduction of the number of dimensions, *viz.*, the independent kind of measurements. The dimensions of mechanics, *e.g.*, are mass, length, and time, and those of thermodynamics, mass, length, time, and the additional dimension of temperature. Simplicity in explanation is effected if it can be shown that temperature is a function of

[4] Singer, E., "Note on the Physical World," this JOURNAL, Vol. 1, p. 626.

[5] Singer, E., *Mind as Behavior*, p. 58.

mass, length, and time. This simplicity or economy is exactly the one that has been attained by the mechanical theory of heat, in which it is shown that temperature is a function of the velocity of certain concealed mass-motions.

II

So far we have considered the meaning of mechanical explanation. We shall now discuss the question of its applicability. Of the many arguments against the objective applicability of mechanism we shall consider two types, *viz.*, epistemological and metaphysical. The epistemological arguments assert that mechanical explanation is only a subjective construction of mind for practical or theoretical purposes and has no objective validity. The metaphysical arguments, on the other hand, are not satisfied with indicating the rôle of mind in the construction of mechanism. They go further in their objections and try to show that the categories of mechanism can not grasp the nature of reality. The second type of argument is based on the distinction between the unreal and the real categories of nature.

1. *The Epistemological Arguments.*—The first epistemological objection to mechanical explanation which we shall mention, is based on what may be called inverted pragmatism. Though mechanism and practical value are not considered identical, it is argued that practical value determines the use of mechanism as a practical substitute for complete evidence. Experience is pictured as a flow or stream of sensations and elements, and scientific concepts are considered merely as expedients to fill in experience. Natural laws are only economical résumés which replace for us "lengthy descriptions of sequences among impressions."[6] They are, in the words of Mach, "mere helps to facilitate our consideration of things."[7] The knowledge gained by their help, therefore, can be of practical value only. The law of gravitation, *e.g.*, is not Newton's discovery of an objective law that guides the motion of the planets, but his technical formulation for describing economically the sequences of sense impressions which are termed planetary motion.

The major assumption of the theory we are considering is that experience is nothing but a stream of sensations, such as colors, sounds, pressures, etc. Causal relations, as they are non-sensational, have no objective validity. They are merely creations of the mind for practical purposes. The statement that one event is the cause of another has no other meaning than that one event is followed by another. This Humian interpretation of experience, however, is open to criticism. If mathematical or causal relations are to be

[6] Karl Pearson. *Grammar of Science,* 2d Ed., pp. 86–87.

[7] *Analysis of Sensation,* Eng., 1877, pp. 186–187.

called unreal because they are abstractions, then sensations and entities must also be called unreal, for they, too, are abstractions. The fundamental assumption of science is that experience can be analyzed into entities and their relations. Without the entities or relations there would be nothing but confusion. It is inconsistent to put the entities in the physical world and their mathematical relations in the mind only, for a mathematical relation is a fact of physics, not of psychology.[8] But even if we grant the theory that experience is nothing but a stream of sensations, it is difficult to understand how in such a world habits and customs are formed, or expedient, economical résumés are created, in terms of which natural laws are interpreted.

The world of sensations and entities apart from their relations is a world of complete indeterminism. In such a world everything conceivable would be possible. We should require two of the three modal categories, *viz.*, the actual and the possible, or the actual and the not yet actual. But if all things conceivable are equally likely, there is not only no reason for judging anything to be more or less possible than anything else, but no basis for forming such judgments.

A second form of epistemological objection tries to show that mechanism is nothing but creation of mind for theoretical purposes. The objectivity of mechanical explanation is denied, and its subjectivity is asserted. Mechanical explanation is created by mind primarily as a condition for apprehension.

Experience, from this second point of view, is not interpreted as a succession of sensations. Succession is only possible, it is pointed out, through the consciousness of necessity that determines the order of successive events. Causality, it is argued, is a necessary and invariable factor in all consciousness, and nothing can be apprehended except in terms of it.

But causal laws or laws of nature are thereby not objective. They are "the very creation of our understanding acting upon the data of our senses. Such laws are not the laws of the Unknowable world at all. They hold only for the show world of our experience. Our own understanding is, therefore, the source of all knowable, rational truth."[9] Natural law is a "hypothesis, a postulate; an epistemological condition of the possibility of scientific experience, but not itself a fact of experience."[10] And by scientific experience it is meant "the ideal of orderly and systematic knowledge in which every item has its place in virtue of universal and necessary laws."[11]

[8] Cohen, M. R., this JOURNAL, Vol. XX, p. 186.

[9] Royce, J., *The Spirit of Modern Philosophy*, p. 477.

[10] Ward, J., *Naturalism and Agnosticism*, Vol. II, p. 220.

[11] *Ibid.*, p. 250.

We do not wish to question here the major assumption of the idealist, *viz.*, that mechanism is created by mind as a condition for apprehension, but it is worth while pointing out that the idealistic interpretation of mechanism does not remove its determinism. The world is determined in a new form. For according to idealism "our world . . . must conform to rigid laws." The mind is "bound by its own nature, . . . to regard all observed facts as conforming to laws." And as it is beyond our power or that of anyone else to alter the way in which understanding constitutes the world, laws of nature are binding, coercive, and independent of our wills and wishes. Here we have the determinism of mechanism in a different garb.

2. *The Metaphysical Arguments.*—The metaphysical arguments against mechanism are not content with asserting the subjectivity of mechanical explanation. They further try to show that the rigid categories of mechanical explanation can not grasp the real nature of reality.

First of all, it is pointed out that reality is historic, and therefore the non-historic categories of science can not explain it. The world is divided into two realms, one of which proves to be a mere appearance of the other. These divisions are sometimes called the "realm of nature" and the "realm of ends," or the "world of description" and the "world of appreciation."

From this point of view the conceptions and categories of science completely break down when compared with the purposive categories of history. Science, it is asserted is only symbolic description of reality, and is therefore unable to furnish a concrete presentment of reality. Reality is behind science. It is history and not science which can give us reality in its concreteness. "With experience in the concrete, we can deal satisfactorily in no other way," writes Ward. "In history we find no mere repetition, no absolute fixity, small scope for measurement or for mathematics, the indispensables of all scientific *conceptions;* yet though affording thus little foothold for positive and exact science, the historical is what we *understand* best and what concerns us most."[12] "Yes, the actual," Ward further writes, "is wholly historical."[13]

In a similar way, for Royce the world of description gives way to the world of appreciation. It is in the world of appreciation, in the world of valuation, in the world of concrete history that we find the most profound truths. Scientific description is necessary but inadequate ". . . in order to make our description valid for all intelligent human beings, the fashions of our description have to be universal. We can't describe the unique, *e.g.,* Shelley's 'sense that

[12] *Ibid.*, Vol. 1, p. 280.
[13] *Ibid.*, p. 281.

at the winds of spring' *etc.* That we have to appreciate.''[14] Science is, then, only a common scheme formed by eliminating the unique, the variable element, in order that all men may be able to establish understanding among themselves, in their practical relations.

That all existing beings are individuals or historic may be conceded to Ward and Royce, but this in no way contradicts the statement that knowledge or significant assertion with reference to any individual or historic event is in terms of non-historic abstractions, non-purposive laws or universals. The individual, apart from its determination, which is in terms of universals, is an abstraction. And if scientific concepts or mechanistic descriptions are to be regarded as abstraction, and therefore unreal, then the characterless historic events or individuals must be relegated to the same realm.

The knowledge of history, let us further note, whether in form of memory or report, meaning by the latter all knowledge communicated to one by word, an eye witness, or tradition, would be of no value unless we assumed the principles of mechanism. The truth of memory-judgment, *e.g.,* is a particular truth, and has all the limitations which such truths possess. The more complete understanding of history is attained by connecting discrete memory-judgments, by enlarging and enriching their significance, and finally by observing that they are consistent with themselves, with one another, and with such results as we derive through inference. This process of reconstruction of memory-judgment would be impossible without the assumption of mechanism. Reports, like memory-judgments, are isolated truths. Even if we could gather all that was written on stone, bronze or paper, our histories would be imperfect. We fill the lacunæ of records and evidence by means of hypotheses based on the principles of mechanical explanation. One who rejects uniformity and determinism must confine himself to the immediate present.

Finally, mechanical explanation is discredited on the ground that it is static and rigid, consequently incapable of grasping a changing reality. Natural laws are, it is asserted, merely repetitions in a superficial sense. Repeat *A*, a cause identically the same, then *B*, an effect, will be repeated identically. But in the real world the character of mere repetition, as expressed by laws, is never found. Identically the same never occurs. At most, the second is similar to the first. The real world being a world of change, flux, and motion, the static concepts of mechanism can never describe it. ''The inherent difficulties of metaphysics . . . arise,'' writes Bergson, ''from our professing to reconstruct reality—which is tendency

[14] *The Spirit of Modern Philosophy,* p. 398.

and consequently mobile—with percepts and concepts whose function it is to make it stationary.''[15] The conceptual mechanism of our ordinary knowledge, and especially of our ''exact'' sciences is claimed to be of a cinematographical kind. They are only snapshots, fixed cross-sections of ceaselessly changing, unforeseeable stream of reality. James, like Bergson, emphasizes this point. ''Reality, life, experience, concreteness, immediacy, use what word you will,'' James writes, ''exceeds our logic, overflows and surrounds it—I prefer bluntly to call reality if not irrational, then at least non-rational in its constitution—and by reality here I mean reality where things happen.''[16]

But change, upon which Bergson and James insist, is not mere change, but explicable change—explicable in reference to something constant. As a matter of fact change is meaningless without its correlative constancy. Logically change is the correlation between different moments of time and the different spatial positions of an object,[17] and if we abolish constancy nothing remains of the fact of change. Professor Montague strikingly illustrates this in his parable of a race where not only the runners, but the judges, the judges' stand and even the race-track are moving without a fixed goal or direction. But by the very motion of everything, what was to have become a super-race has become utterly meaningless.[18]

Let us also remark that change, flux, motion, which are so sharply distinguished by Bergson and James from concepts, are concepts themselves, and if we do not identify or confuse concepts with images, but consider them as indicating relations between terms, then they become the means to understand the meaning of change. The fact of change, then, does not contradict or invalidate the concepts of the ''exact'' sciences.

In this paper we have discussed the meaning of mechanical explanation and have defended it against epistemological and metaphysical arguments. There are, of course, other types of arguments against mechanism, for instance, the biological and psychological arguments presented by the vitalists. Thus far, however, we have found no valid reason for discarding mechanism or for considering it merely a useful fiction.

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[15] *An Introduction to Metaphysics*, tr. by Hulme, p. 67.
[16] *A Pluralistic Universe*, p. 212.
[17] Cohen, M. R., this JOURNAL. 1925, Vol. XXII, p. 123.
[18] *Studies in the History of Ideas*, Vol. I, p. 235.

BOOK REVIEWS

A Theoretical Basis of Human Behavior. A. P. Weiss. Columbus: R. G. Adams & Co. 1925. Pp. xv + 428.

Howsoever tardily scientific truth may travel or how frequently it may suffer complete wrecking, this is not apparently the fate of objectivism in psychology. No one can follow the trend of the objective movement without receiving the impression that as a scientific development it is decidedly growing in favor and even receiving the (not unreluctant and sometimes disguised) approval of professed subjectivists. For this reason all who are interested in objective psychology will be exceedingly grateful to Professor Weiss for giving us a comprehensive and delightfully presented statement of one type of objective psychology. More than this, the present volume has the great merit of clarifying the issues arising between those who incline toward different angles of objectivism, so that agreements and disagreements are clearly indicated.

The first of the three parts into which Professor Weiss divides his book is devoted to a statement of Fundamental Principles. Here we find a clear sweeping away of the old spiritualistic conceptions and statements. In the ultimate analysis psychological phenomena are reducible to electron-proton configurations, in other words, the materials of the most extreme objective sciences. There are those (among them the reviewer) who fail to see the necessity of going so far beyond actual psychological phenomena to their ultimate nature. But this is in no sense a criticism of Professor Weiss, for he does not, as we shall presently point out, neglect the actual responses of organisms in contact with stimuli objects and things. In presenting the proton-electron conception, the author is merely indicating that at no point is any psychic energy or force necessary in the science of psychology. Professor Weiss accepts the doctrine of an ultimate proton-electron monism as an alternative to the view that proton-electron configuration can be reduced to psychic or mental actions or products. The latter are defined as non-material, imponderable forces or agents. The purpose of accepting this attitude is to bring psychology into the realm of the natural sciences.

In part two of his volume Professor Weiss makes an elaborate analysis of human behavior, which he defines as the responses of an organism to its surroundings or its interactions with those surroundings. Responses are divided into two types, the Biophysical and the Biosocial. The former are described as the functioning of the sensory-cerebral-motor structures, while the latter are characterized

as those movements or motor effects which establish the individual's coöperative status in the social organization to which he belongs. Despite the difference in names, there is really no difference, of course, between these types of responses. It is probably fair to say that they are only descriptive aspects of the same actions. Differences between actions are only to be determined on the basis of the objects to which responses are made, since all human behavior or human achievement is the function of the sensory-cerebro-motor mechanism, in the same way as respiration is a function of the lungs, and digestion the function of the alimentary tract. The primary fact about biosocial responses or aspects is that they constitute stimuli for another organism. The biophysical response is elaborately analyzed into anatomical elements, physiological processes, and the biophysical mechanisms. The biosocial responses comprise such factors as language, discrimination, generalization, abstraction, *etc.* On the whole the summation of all the different elements and mechanisms goes far in describing in an exceptionally lucid manner what the organism is and does in its contacts with the surroundings and persons.

In the opinion of the reviewer there is nothing left out of Professor Weiss' psychological descriptions to justify the now familiar anti-behavioristic complaint that objective psychology neglects essential factors of human psychological phenomena. For the author not only gives us a statement of what the organism is (as a biological object) and does in response to things and persons, but he also informs us concerning the individual's social status. In this discussion we are told about the person's behavior life history, which accounts for his particular behavior characteristics and his variations from other persons within specified collectivities. In concluding part two Professor Weiss expertly criticizes the traditional conceptions of consciousness, introspection, mind, *etc.*, and proposes a behavioristic interpretation of the phenomena presumably represented by such terms, as well as imagery, sensation, *etc.*

In part three Professor Weiss discusses in a clear and convincing manner a series of specific response categories, among others language, thinking, desire, purpose, volition, emotion, *etc.* This part of the book is in effect an attempt at a factual statement of complex human behavior. Whether one accepts these descriptions or not, certainly the author demonstrates that even the elaborate activities of man are subject to description in an objective and natural science manner.

Those who read Professor Weiss' volume will doubtless conclude that it is brilliantly conceived and executed. There are, however,

certain overemphases bespeaking a polemical adaptation on the part of the author which to the reviewer appear to mar the harmony of the complete work. We have already referred to the stress of the proton-electron conception. Although this emphasis is necessary for Professor Weiss in order to counteract the spiritualistic interpretation, it interferes somewhat with one's appreciation of his descriptions of psychological phenomena. For it is not necessary at any point, so far as the science of psychology is concerned, to stress the abstractions of the physical scientist, even though they are more closely connected with natural phenomena (not psychological) than are the spiritualistic abstractions of the traditional psychologist (with psychological phenomena). While the stress of the electron-proton configuration conception should not give comfort to the opponents of objective psychology as a sign that Weiss' behaviorism is not the science of human psychological phenomena, the emphasis of the electron-proton conception does precipitate misunderstanding.

Another overemphasis in the exposition which troubles the reviewer is found in the statement that "behaviorism is the science that studies the origin and development of those bodily movements (responses) of the individual which establish his status in the social organization of which he is a member." It seems that it is this stressing of body and its functions, instead of always discussing the activities of an organism in intimate relation with stimuli both while acquiring and performing reactions, which forces the author to conceive of psychology as a middle ground between the natural and the social sciences, and a dependency of sociology. The reviewer is not convinced that discrimination, for example, is a social phenomenon or involves other persons, howsoever true it may be that social life and other persons are invariably part of the environment of a discriminating human organism. We can describe completely discrimination and generalization responses, though not linguistic reactions or essentially social discriminations as facts developing in the contacts of a single individual with surrounding objects. Professor Weiss lays himself open to the accusation that he saves himself from leaning too heavily upon the traditional physiological psychology with a compensation based upon sociological factors.

As a third instance of an unsatisfactory emphasis in exposition is the stressing of the nervous system and its mechanisms as factors in responses. While Professor Weiss does not impute any magical power to the nervous system, he assumes that there are such neural response factors inherited as provide mechanical, artistic, gentle, and pugnacious personality characteristics. To the reviewer there is a distinct hiatus introduced here between this type of exposition and

the description of the behavior life history of the individual which accounts on an observable basis both for his immediate reactions and his behavior characteristics. It is the opinion of the reviewer that the assumption of the inheritance of behavior qualities and personality traits is a barrier to the establishment of a strict naturalistic psychology.

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JOURNALS AND NEW BOOKS

REVUE PHILOSOPHIQUE. 51e Année, Nos. 11 et 12. Physique et philosophie de la nature à la fin du XIX siècle: *A. Rey.* La philosophie de la religion dans les pays de langue française de 1914 à 1925: *E. Leroux.* La place de l'idée du malheur de la conscience dans la formation des théories de Hegel: *J. Wahl.* Note sur le temps: *G. Bénézé.*

RIVISTA DI FILOSOFIA. Anno XVII, N. 3. Critica dell'irrazionalismo del Meyerson: *Annibale Pastore.* Morale e religione nello Shaftesbury: *Luigi Bandini.* Filosofia e pedagogie: *A. Poggi.* La valutazione del tempo nell'idealismo: *F. Masi Pietrosi.*

SCIENTIA. Vol. XL, N. CLXXVI–12. La cosmogonie dualiste et tourbillonnaire: *A. Boutaric.* Neue Wege der Protoplasma-Forschung: *F. Weber.* La lingua sacra dell'India: *A. M. Pizzagalli.* The New Malthusianism in the Light of Actual World Problems of Population: *G. W. Knibbs.*

JOURNAL DE PSYCHOLOGIE. XXIII Année, No. 9. L'orientation lointaine et la reconnaissance des lieux (*fin*): *Et. Rabaud.* En quoi consiste et d'où dérive le finalisme des phénomènes psychiques: *E. Rignano.* Sur le mécanisme de l'anarthrie et sur les troubles associés du langage intérieur: *A. Ombredane.* Mouvement et psychisme: *H. Wallon.*

ARCHIVES DE PSYCHOLOGIE. Tome XX, No. 78. L'enseignement psychiatrique d'Adolf Meyer: *Henri Flournoy.* La contradiction et l'esprit humain: *A. Naville.* La psychologie, science autonome: *G. Heymans.*

BULLETIN DE L'INSTITUT GENERAL PSYCHOLOGIQUE. 26e Année, Nos. 4–6. L'exposition de l'enfance. La mesure du développement de l'intelligence: *Th. Simon.* Les jardins d'enfants: *M. Bonne.* L'éducation sensorielle du petit enfant: *E. Flayol.*

ZEITSCHRIFT FÜR PSYCHOLOGIE. Bd. 101, Heft 1 bis 3. Zur Psychologie des arithmetischen Mittels: *A. Prandtl.* Zur Psychologie des Konsonanzerlebens: *F. N. Siegfried.* Studien über Strukturgesetze: *H. Werner.* (V: Ueber die Ausprägung von Tongestalten). Ein neuer Nystagmograph (Mikrokinetograph.) *L. Galley.*

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JOURNAL OF EXPERIMENTAL PSYCHOLOGY. Vol. IX, 6. Two Factors in the Work Decrement: *E. S. Robinson* and *A. G. Bills.* Reading Reactions for Mathematical Formulæ: *M. A. Tinker.* The Influence of Context upon Learning and Recall: *S. Pan.* Variability of Judgments on Musical Intervals: *H. Moran* and *C. C. Pratt.*

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PSYCHOLOGICAL BULLETIN. Vol. 23, No. 10. General Reviews and Summaries. Cutaneous and Kinæsthetic Senses: *J. T. Metcalf.* Color Defects—Measurement, Classification, Heredity: *S. P. Hayes.* Visual Illusions, with Special Reference to Seen Movement: *P. C. Squires.* Synesthesia: *H. S. Langfeld.*

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Stevenson Smith. A Further Study of the Development of Behavior in Vertebrates Experimentally Removed from the Influence of External Stimulation: *Leonard Carmichael.* The Present Status of the Tendency to Collect and Hoard: *H. C. Lehman* and *P. A. Witty.* The Historical Development of Comparative Psychology: *C. J. Warden.*

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Wallner, Nico: Fichte als politischer Denker. Werden und Wesen seiner Gedanken über den Staat. Halle: Max Niemeyer. 1926. 280 pp. 12M.

Baldwin, James Mark: Between Two Wars, 1861–1921. Being Memories, Opinions, and Letters Received. 2 vols. Boston: The Stratford Co. 1926. 302 pp.; xiii + 358 pp. $10.00.

Burkamp, Wilhelm: Begriff und Beziehung. Studien zur Grundlegung der Logik. Leipzig: Felix Meiner. 1927. xi + 306 pp. 12.50 M.

Lewis, Clarence Irving: The Pragmatic Element in Knowledge. The Annual Howison Lecture, 1926. (University of California Publications in Philosophy, Vol. 6, No. 3, pp. 205–227.) Berkeley: University of California Press. 1926.

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NOTES AND NEWS

We have received an announcement of a new psychological journal, *Psychological Abstracts,* which will be published by the American Psychological Association under the editorship of Professor Walter S. Hunter of Clark University, who will be assisted by a number of co-operating editors from foreign countries. The first number will appear January, 1927.

The journal will be international in character. It will consist of non-critical abstracts of articles and books on psychological and cognate subjects, which will appear as soon as possible after the original publication. These abstracts will be prepared by competent psychologists in America and Europe. They will be published in English and will average one hundred and fifty words each. The scope of the journal is indicated by the following classification of its material: General Topics of Psychology; Sensation and Perception; Feeling and Emotion; Attention, Memory, and Thought; Nervous System; Motor Phenomena and Action; Plant and Animal Behavior; Evolution and Heredity; Special Mental Conditions; Nervous and Mental Disorders; Social Functions of the Individual; Industrial and Personnel Problems; Childhood and Adolescence; Educational Psychology; Biometry and Statistics; Mental Tests.

It is the intention of the Association to make the Abstract Journal invaluable, not only to psychologists throughout the world, but also to all persons who are working in allied fields, such as physiology, psychiatry, education, and biology.

Extra copies of the January and February issues will be sent for examination on request. The annual subscription is $6.00 (overseas, $6.25). Subscriptions may be sent to H. S. Langfeld, Managing Editor, Princeton University, Princeton, N. J., (checks payable to *Psychological Abstracts*).

Directory of American Psychological Periodicals

American Journal of Psychology.—Ithaca, N. Y.; Cornell University.
Subscription $6.50. 624 pages annually. Edited by E. B. Titchener.
Quarterly. General and experimental psychology. Founded 1887.

Pedagogical Seminary and Journal of Genetic Psychology.—Worcester, Mass.; Clark University.
Subscription $7.00. 700 pages annually. Edited by Carl Murchison and international co-operating board. [1891.
Quarterly. Child behavior, differential and genetic psychology. Founded

Genetic Psychology Monographs—Worcester, Mass.: Clark University.
Subscription $7.00. 600 pages annually. Edited by Carl Murchison and an international coöperating board.
Bi-monthly from January 1926. Each number one complete research.
Child behavior, differential and genetic psychology. Founded 1925.

Psychological Review.—Princeton, N. J.; Psychological Review Company.
Subscription $5.00. 480 pages annually.
Bi-monthly. General. Founded 1894. Edited by Howard C. Warren and John B. Watson.

Psychological Bulletin.—Princeton, N. J.; Psychological Review Company.
Subscription $5.50. 720 pages annually. Psychological literature.
Monthly. Founded 1904. Edited by Samuel W. Fernberger.

Psychological Monographs.—Princeton, N. J.; Psychological Review Company.
Subscription $6.00 per volume. 500 pages. Founded 1895. Edited by Shepherd I. Franz.
Published without fixed dates, each issue one or more researches.

Psychological Index.—Princeton, N. J.; Psychological Review Company.
Subscription $2.00. 200 pages. Founded 1895. Edited by W. S. Hunter.
An annual bibliography of pyschology literature.

Journal of Philosophy.—New York; 515 West 116th Street.
Subscription $4.00. 728 pages per volume. Founded 1904.
Bi-weekly. Edited by F. J. E. Woodbridge, Wendell T. Bush and H. W. Schneider.

Archives of Psychology.—Sub-Station 84, New York; Archives of Psychology.
Subscription $5.00. 500 pages per volume. Founded 1906. Edited by R. S. Woodworth.
Published without fixed dates, each number a single experimental study.

Journal of Abnormal Psychology and Social Psychology.—Albany, N. Y.
Subscription $5.00. Boyd Printing and Publishing Co. Edited by Morton Prince in co-operation with Floyd H. Allport.
Quarterly. 432 pages annually. Founded 1906. Abnormal and social.

Psychological Clinic.—Philadelphia; Psychological Clinic Press. [1907.
Subscription $2.50. 288 pages. Edited by Lightner Witmer. Founded
Without fixed dates (9 numbers). Orthogenics, psychology, hygiene.

Training School Bulletin.—Vineland, N. J.; The Training School.
Subscription $1.00. 160 pages annually. Edited by E. R. Johnstone. Founded 1904.
Monthly (10 numbers). Psychology and training of defectives.

Comparative Psychology Monographs.—Baltimore; Williams & Wilkins Co.
Subscription $5.00. 500 pages per volume. Edited by W. S. Hunter.
Published without fixed dates, each number a single research.

Psychoanalytic Review.—Washington, D. C.; 3617 Tenth Street, N. W.
Subscription $6.00. 500 pages annually. Psychoanalysis.
Quarterly. Founded 1913. Edited by W. A. White and S. E. Jelliffe.

Journal of Experimental Psychology.—Princeton, N. J.
Psychological Review Company. 480 pages annually. Experimental.
Subscription $5.00. Founded 1916. Bi-monthly. Edited by Madison Bentley.

Journal of Applied Psychology.—Worcester, Mass.; Florence Chandler.
Subscription $5.00. 400 pages annually. Founded 1917.
Quarterly. Edited by James P. Porter and William F. Book.

Journal of Comparative Psychology.—Baltimore; Williams & Wilkins Co.
Subscription $5.00. 500 pages annually. Founded 1921.
Bi-monthly. Edited by Knight Dunlap and Robert M. Yerkes. J.P.

THE JOURNAL OF PHILOSOPHY

There is no similar journal in the field of scientific philosophy. It is issued fortnightly and permits the quick publication of short contributions, prompt reviews, and timely discussions. The contents of the last six issues are as follows:

Volume XXIII. No. 21. October 14, 1926.

The Fable of the Bees. STERLING P. LAMPRECHT.
Book Reviews. Journals and New Books. Notes and News.

Volume XXIII. No. 22. October 28, 1926.

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